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09/911,602	07/24/2001	Michael G. Oravecz	7888/83717	5678

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Welsh & Katz, Ltd.
22nd Floor
120 South Riverside Plaza
Chicago, IL 60606

EXAMINER	
MILLER, ROSE MARY	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/911,602	Applicant(s) ORAVECZ, MICHAEL G.	
	Examiner Rose M Miller	Art Unit 2856	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 18 May 2004.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-61 is/are pending in the application.

4a) Of the above claim(s) 40-61 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-39 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hashimoto '604 (JP 11009604A)** in view of **Nigam (US 4,043, 181)** and **DePetrillo (US 6,374,675 B1)**.

Hashimoto '604 discloses a data memory (142) containing data produced by interrogating a sample at three-dimensionally varied locations in the sample with a pulsed ultrasonic probe (2), the date including for each location a digitized A-scan (sound ray data) for that location.

Hashimoto '604 discloses the claimed invention with the exception of the object being tested for comprising a microelectronic sample. **Nigam** teaches at column 1 lines 5-50 that it is known in the art of ultrasonic measuring and testing to utilize pulse echo testing for "non-invasive imaging of humans and animals in studying the internal anatomy, as well as for nondestructive testing of engineering materials for flaws, inclusions, cracks or fissures" and to utilize any combination of "A-, B-, or C-scan

presentation" on a display "as the ultrasound beam is scanned over the object to produce a television-type image of the interior of the object." **DePetrillo** teaches that it is known to test a "microelectronic sample" (or integrated circuit) for the presence of cracks and defects utilizing a C-Mode Scanning Acoustic Microscope which utilizes a series of A-scans to generate the image of object under test (see column 3 line 6 - column 4 line 34). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Hashimoto '604** to test a microelectronic sample as **Nigam** teaches the compatibility of testing both medical and nondestructively with a pulse echo system and **DePetrillo** teaches the use of A-scans combined to provide a image of a microelectronic sample in order to indicate the location and presence of defects within the sample.

With regards to claim 2, it is inherent in the system disclosed by **Hashimoto '604** to include locations representing a series of X-Y planes displaced along the Z-axis of the probe (see Figures 4, 8, and 9 which define volumes being) as **Hashimoto '604** clearly discloses performing a volume scan of the sample under test and such volume scans inherently cover X-Y planes displaced along the Z-axis.

With regards to claims 3 and 4, it is inherent in the system of **Hashimoto '604** to utilize probed locations within the depth of field of the transducer as testing for a location within the depth of field of the transducer would enable a better scan result than if the location was outside the field of the transducer.

4. Claims 1-2 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ishibashi et al. (US 4,980,865)** in view of **DePetrillo**.

Ishibashi et al. discloses a data memory (B mode memory 19) containing data produced by interrogating a sample at three-dimensionally varied locations in the sample with a pulsed ultrasonic probe (2), the date including for each location a digitized A-scan for that location.

Ishibashi et al. discloses the claimed invention with the exception of the object being tested for comprising a microelectronic sample. **DePetrillo** teaches that it is known to test a "microelectronic sample" (or integrated circuit) for the presence of

cracks and defects utilizing a C-Mode Scanning Acoustic Microscope which utilizes a series of A-scans to generate the image of object under test (see column 3 line 6 - column 4 line 34). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Ishibashi et al.** to test a microelectronic sample as **DePetrillo** teaches the use of A-scans combined to provide a C-Mode image of a microelectronic sample in order to indicate the location and presence of defects within the sample.

With regards to claim 2, **Ishibashi et al.** discloses including locations representing a series of X-Y planes displaced along the Z-axis of the probe (see Figures and column 3 line 55 - column 4 line 44).

5. Claims 5-6 and 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Shokrollahi et al. (US 6,200,266 B1)** in view of **Nigam** and **DePetrillo**.

With regards to claims 5 and 6, **Shokrollahi et al.** discloses a memory for storing a set of data for each of a number of acoustic impedance features within an actual sample interrogated by a pulsed ultrasonic probe, the data set including for each of said impedance features a plurality of acoustic reflectance values resulting from excitations by said ultrasonic probe of different locations within said sample (see column 6 lines 43-45, column 7 lines 3-20 and column 8 lines 1-9).

Shokrollahi et al. discloses the claimed invention with the exception of the object being tested for comprising a microelectronic sample. **Nigam** teaches at column 1 lines 5-50 that it is known in the art of ultrasonic measuring and testing to utilize pulse echo testing for "non-invasive imaging of humans and animals in studying the internal anatomy, as well as for nondestructive testing of engineering materials for flaws, inclusions, cracks or fissures" and to utilize any combination of "A-, B-, or C-scan presentation" on a display "as the ultrasound beam is scanned over the object to produce a television-type image of the interior of the object." **DePetrillo** teaches that it is known to test a "microelectronic sample" (or integrated circuit) for the presence of cracks and defects utilizing a C-Mode Scanning Acoustic Microscope which utilizes a series of A-scans to generate the image of object under test (see column 3 line 6 -

column 4 line 34). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Shokrollahi et al.** to test a microelectronic sample as **Nigam** teaches the compatibility of testing both medical and nondestructively with a pulse echo system and **DePetrillo** teaches the use of A-scans combined to provide a image of a microelectronic sample in order to indicate the location and presence of defects within the sample.

With regards to claims 8 and 9, **Shokrollahi et al.** discloses interrogating a sample at three-dimensionally varied locations in a sample with a pulsed ultrasonic probe, developing data produced by the pulsed probe, the data including for each location interrogated a digitized A-Scan for that location; storing the developed data in a memory, and accessing the data memory to retrieve and display said data (see column 6 lines 43-45, column 7 lines 3-20 and column 8 lines 1-9).

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Hashimoto '664 (JP 2000132664A)** in view of **Nigam** and **DePetrillo**.

Hashimoto '664 discloses a 4D virtual sample data store (see abstract and Figures) containing data produced by a pulsed ultrasonic probe (1) and representing for each point in an interrogated sample volume (see Figures and abstract) three spatial dimensions and a time variable, the time variable comprising a digitized time-varying waveform including characterizations of reflections from acoustic impedance features n the examined sample (see Figures and abstract).

Hashimoto '664 discloses the claimed invention with the exception of the object being tested for comprising a microelectronic sample. **Nigam** teaches at column 1 lines 5-50 that it is known in the art of ultrasonic measuring and testing to utilize pulse echo testing for "non-invasive imaging of humans and animals in studying the internal anatomy, as well as for nondestructive testing of engineering materials for flaws, inclusions, cracks or fissures" and to utilize any combination of "A-, B-, or C-scan presentation" on a display "as the ultrasound beam is scanned over the object to produce a television-type image of the interior of the object." **DePetrillo** teaches that it is known to test a "microelectronic sample" (or integrated circuit) for the presence of

cracks and defects utilizing a C-Mode Scanning Acoustic Microscope which utilizes a series of A-scans to generate the image of object under test (see column 3 line 6 - column 4 line 34). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Hashimoto '664** to test a microelectronic sample as **Nigam** teaches the compatibility of testing both medical and nondestructively with a pulse echo system and **DePetrillo** teaches the use of A-scans combined to provide a image of a microelectronic sample in order to indicate the location and presence of defects within the sample.

7. Claim 7 rejected under 35 U.S.C. 103(a) as being unpatentable over **Olstad et al. (US 5,515,856)** in view of **Nigam** and **DePetrillo**.

Olstad et al. discloses a 4D virtual sample data store (see Figures and abstract) containing data produced by a pulsed ultrasonic probe (11 or 21) and representing for each point in an interrogated sample volume (see Figures) three spatial dimensions and a time variable, the time variable comprising a digitized time-varying waveform including characterizations of reflections from acoustic impedance features n the examined sample (see column 3 line 49 -column 7 line 48).

Olstad et al. discloses the claimed invention with the exception of the object being tested for comprising a microelectronic sample. **Nigam** teaches at column 1 lines 5-50 that it is known in the art of ultrasonic measuring and testing to utilize pulse echo testing for "non-invasive imaging of humans and animals in studying the internal anatomy, as well as for nondestructive testing of engineering materials for flaws, inclusions, cracks or fissures" and to utilize any combination of "A-, B-, or C-scan presentation" on a display "as the ultrasound beam is scanned over the object to produce a television-type image of the interior of the object." **DePetrillo** teaches that it is known to test a "microelectronic sample" (or integrated circuit) for the presence of cracks and defects utilizing a C-Mode Scanning Acoustic Microscope which utilizes a series of A-scans to generate the image of object under test (see column 3 line 6 - column 4 line 34). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Olstad et al.** to test a microelectronic

sample as **Nigam** teaches the compatibility of testing both medical and nondestructively with a pulse echo system and **DePetrillo** teaches the use of A-scans combined to provide a image of a microelectronic sample in order to indicate the location and presence of defects within the sample.

8. Claims 10-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Olstad et al.** in view of **Nigam**, **DePetrillo**, and **Shokrollahi et al.**

With regards to claims 10 and 14, **Olstad et al.** discloses a method for creating a 4D virtual sample memory comprising employing a pulsed ultrasonic probe to interrogate a sample a plurality of times (see Figures and abstract), developing a set of data for each of a number of acoustic impedance features within the sample interrogated by the pulsed probe, storing the developed data in a data memory, and accessing the data memory to retrieve stored data and producing a display which exhibits acoustic impedance features.

Olstad et al. discloses the claimed invention with the exception of the data set including a plurality of acoustic reflectance values resulting from excitations of different locations within the sample by the ultrasonic probe and the sample comprising a microelectronic sample.

Nigam teaches at column 1 lines 5-50 that it is known in the art of ultrasonic measuring and testing to utilize pulse echo testing for "non-invasive imaging of humans and animals in studying the internal anatomy, as well as for nondestructive testing of engineering materials for flaws, inclusions, cracks or fissures" and to utilize any combination of "A-, B-, or C-scan presentation" on a display "as the ultrasound beam is scanned over the object to produce a television-type image of the interior of the object."

DePetrillo teaches that it is known to test a "microelectronic sample" (or integrated circuit) for the presence of cracks and defects utilizing a C-Mode Scanning Acoustic Microscope which utilizes a series of A-scans to generate the image of object under test (see column 3 line 6 - column 4 line 34).

Shokrollahi et al. teaches that it is known in the art of ultrasonic measuring and testing to store scan results in the form of acoustic reflectance values in order to reduce the noise and error produced by storing the full signal.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Hashimoto '604** to test a microelectronic sample as **Nigam** teaches the compatibility of testing both medical and nondestructively with a pulse echo system and **DePetrillo** teaches the use of A-scans combined to provide a image of a microelectronic sample in order to indicate the location and presence of defects within the sample, and to further modify **Olstad et al.** to include the storage capabilities of **Shokrollahi et al.** in order to reduce the errors produced by the ultrasonic testing system.

With regards to claims 11 and 15, it would have been obvious to one of ordinary skill in the art to utilize probed locations within the depth of field of the transducer (in-focus acoustic reflectance data) as testing for a location within the depth of field of the transducer (in-focus) would enable a better scan result than if the location was outside the field of the transducer.

With regards to claims 12 and 16, it would have been obvious to one of ordinary skill in the art to utilize probed locations outside the depth of field of the transducer (out-of-focus acoustic reflectance data) as testing for a location outside the depth of field of the transducer (out-of-focus), while difficult, provides for a wider scan result with a single pulse than would otherwise be possible if the system was restricted to receiving data from in-focus locations only.

With regards to claims 13 and 17, it would have been obvious to one of ordinary skill in the art to utilize probed locations both inside the depth of field of the transducer (in-focus) and outside the depth of field of the transducer (out-of-focus acoustic reflectance data) as testing for both locations, while difficult, provides for a wider scan result with a single pulse than would otherwise be possible if the system was restricted to receiving data either from in-focus or out-of-focus locations only.

9. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Olstad et al.** in view of **Nigam**, **DePetrillo**, and **Suzuki et al. (JP 10277042 A)**.

Olstad et al. discloses interrogating a sample a plurality of times to develop data representing for each interrogated point in the sample three spatial dimensions and a time variable, the time variable comprising a digitized time-varying waveform characterizing reflections from acoustic impedance features in the examined sample and storing the developed data in a data memory.

Olstad et al. discloses the claimed invention with the exception of utilizing varying probe focus settings to develop the data and the sample comprising a microelectronic sample.

Nigam teaches at column 1 lines 5-50 that it is known in the art of ultrasonic measuring and testing to utilize pulse echo testing for "non-invasive imaging of humans and animals in studying the internal anatomy, as well as for nondestructive testing of engineering materials for flaws, inclusions, cracks or fissures" and to utilize any combination of "A-, B-, or C-scan presentation" on a display "as the ultrasound beam is scanned over the object to produce a television-type image of the interior of the object."

DePetrillo teaches that it is known to test a "microelectronic sample" (or integrated circuit) for the presence of cracks and defects utilizing a C-Mode Scanning Acoustic Microscope which utilizes a series of A-scans to generate the image of object under test (see column 3 line 6 - column 4 line 34).

Suzuki et al. teaches that it is known in the art of ultrasonic measuring and testing to utilize synthetic aperture focusing to vary the focus of the ultrasonic probe in order to improve the image produced by the system.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Olstad et al.** to test a microelectronic sample as **Nigam** teaches the compatibility of testing both medical and nondestructively with a pulse echo system and **DePetrillo** teaches the use of A-scans combined to provide a image of a microelectronic sample in order to indicate the location and presence of defects within the sample and it would have been further obvious to one of ordinary skill in the art at the time the invention was made to provide the system of **Olstad et al.** with

the synthetic aperture feature of **Suzuki et al.** in order to vary the focus of the ultrasonic probe used in the system and to produce an improved image of the sample.

10. Claims 19-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Ishibashi et al.** in view of **DePetrillo** and **Weng (US 5396,890)**.

With regards to claims 19-23 and 26-29, **Ishibashi et al.** discloses deriving for each of a plurality of locations in the X-Z plane a digitized time-varying acoustic reflectance signal uniquely associated with each location and storing the signals (in B-mode memory 19). **Ishibashi et al.** also discloses refocusing the probe as necessary to obtain the desired signals. **Ishibashi et al.** further discloses testing a series of locations in a first plane of the sample volume and then testing a series of location in a second plane of the sample volume, the second plane being displaced from the first plane, wherein said first plane is the X-Y plane or the first plane is the X-Z plane, Y-Z plane, or another Z plane.

Ishibashi et al. discloses the claimed invention with the exception of the signals being non-peak-detected signals and the sample comprising a microelectronic sample.

DePetrillo teaches that it is known to test a "microelectronic sample" (or integrated circuit) for the presence of cracks and defects utilizing a C-Mode Scanning Acoustic Microscope which utilizes a series of A-scans to generate the image of object under test (see column 3 line 6 - column 4 line 34).

Weng teaches that it is known in the art of ultrasonic measuring and testing to perform a three-dimension scan of an object without utilizing peak-detected signals.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify **Ishibashi et al.** to test a microelectronic sample as **DePetrillo** teaches the use of A-scans combined to provide a C-Mode image of a microelectronic sample in order to indicate the location and presence of defects within the sample and to further modify **Ishibashi et al.** to remove the peak-detection of the received signals of **Ishibashi et al.** as **Weng** teaches such peak-detection is not necessary for performing a three-dimensional scan of a sample. Furthermore, it has been held by the courts that the elimination of a feature and its function is not a

patentably distinct invention. Please see In re Karlson, 136 USPQ 184 (CCPA 1963), In re Wilson, 153 USPQ 740 (CCPA 1967), and Ex parte Rainu, 168 USPQ 375 (PTO Bd. Of App. 1969). Therefore, the removal of the peak-detection and its function from the system of **Ishibashi et al.** is not a patentably distinct invention.

With regards to claims 24 and 25, it would have been obvious to one of ordinary skill in the art at the time the invention was made to change the focus setting of the transducer probe and/or the gain applied to the received signals before the second plane is interrogated if the position of the second plane required such a focus change and/or gain change in order to produce the best test results.

With regards to claims 30-31, it would have been obvious to one of ordinary skill in the art to control the focus of the probe during each scanning operation such that each of the interrogated planes is in focus (including the scans being made successively in planes displaced in the direction of the probe and including the displacement of the scans to be substantially equal to the depth of field of the probe) as testing for a location within the depth of field of the transducer (in-focus) would enable a better scan result than if the location was outside the field of the transducer.

With regards to claim 32, it would have been obvious to one of ordinary skill in the art to utilize scans made successively in planes displaced in the direction of the probe and including causing the displacement of the scans between planes to be greater than the depth of field of the probe in order to create an underscan condition as it is well known throughout the art of ultrasonic measuring and testing to try to limit the amount of data procured during a testing cycle. The utilization of the underscan condition is a popular testing feature when the portion of the sample under test needs to be tested but is not of such a great importance that every minor feature needs to be recorded.

With regards to claim 33, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize an overscan feature (causing the displacement of the scans to be less than the depth of field of the probe) in the system of **Ishibashi et al.** as the overscan is well known throughout the art of ultrasonic measuring and testing for insuring that every feature of the test object is measured.

Performed by overlapping signals, the overscan allows a testing operator to be sure that a feature which could cause problems is not inadvertently overlooked.

With regards to claims 34-37, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the gain of the received signal to compensate for many features, including display attenuation and depth attenuation, as **Ishibashi et al.** teaches at column 8 lines 20-37 adjusting the gain of the received signals in order to improve the testing results.

With regards to claims 38-39, **Ishibashi et al.** teaches combining the individual signals received and stored in the B-Mode memory (19) into a three-dimensional memory storage (20) in order to obtain a full three dimensional representation of the sample under test.

Response to Arguments

11. Applicant's arguments with respect to claims 1-39 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rose M Miller whose telephone number is 571-272-2199. The examiner can normally be reached on Monday - Friday, 7:30 am to 3:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hezron Williams can be reached on 571-272-2208. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

RMM
23 July 2004

HEZRON WILLIAMS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800